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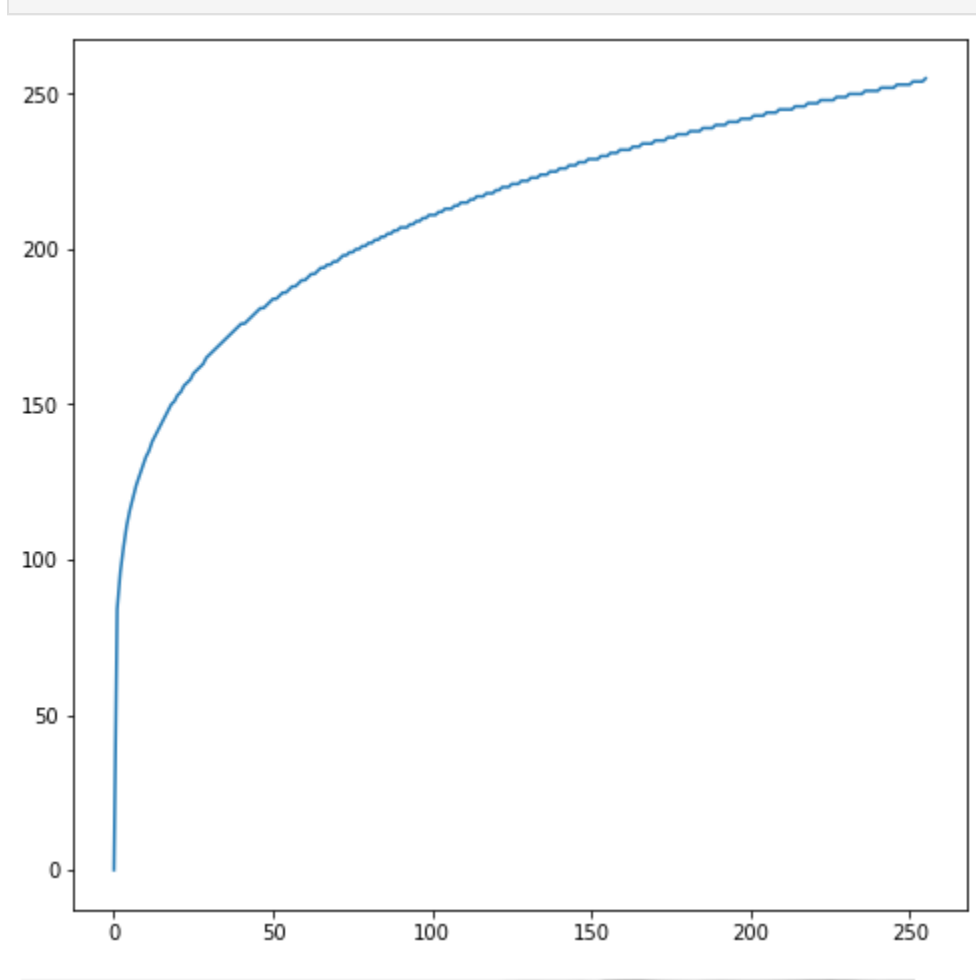
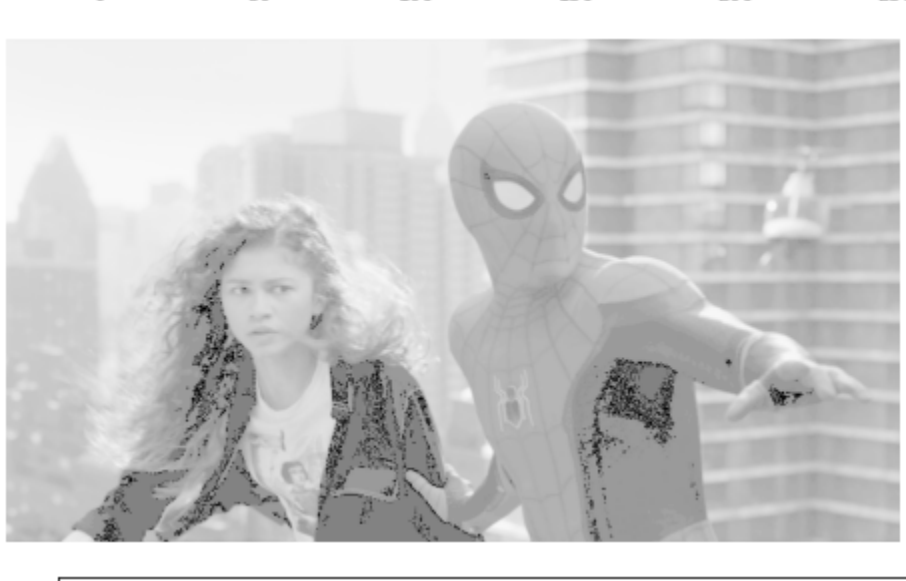
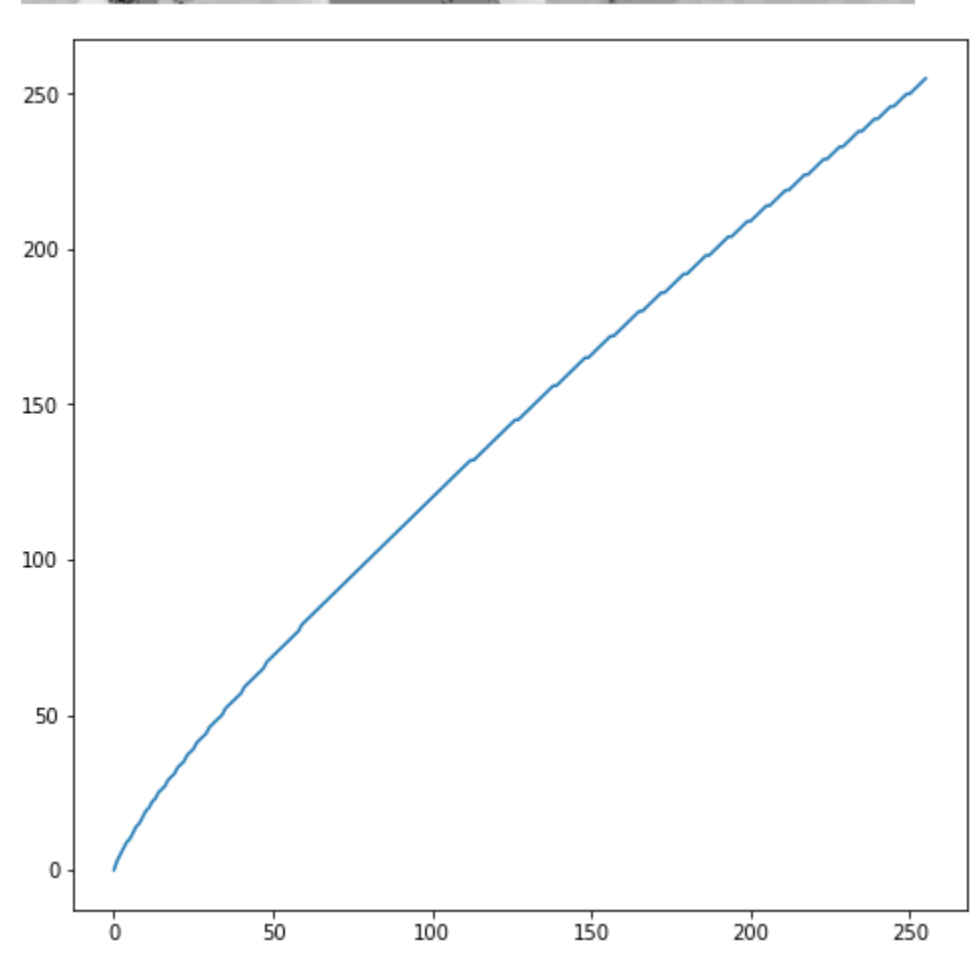
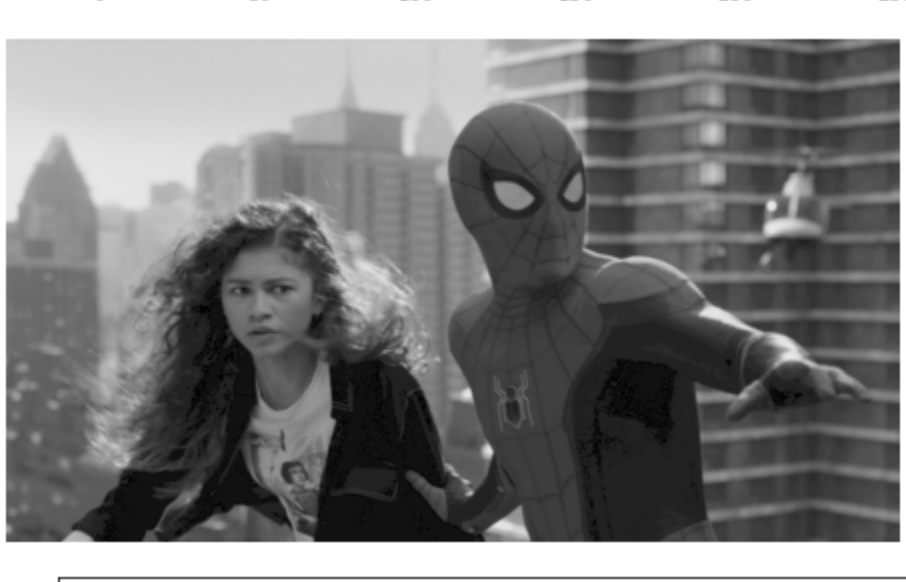
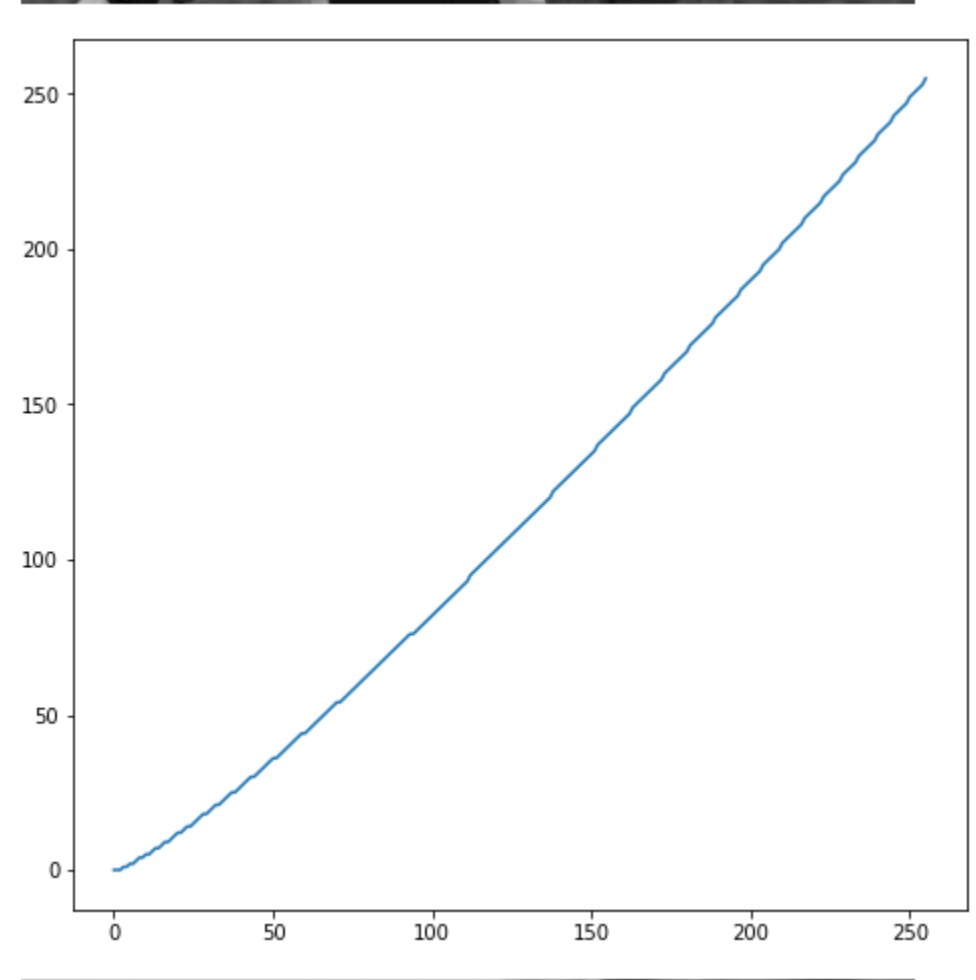
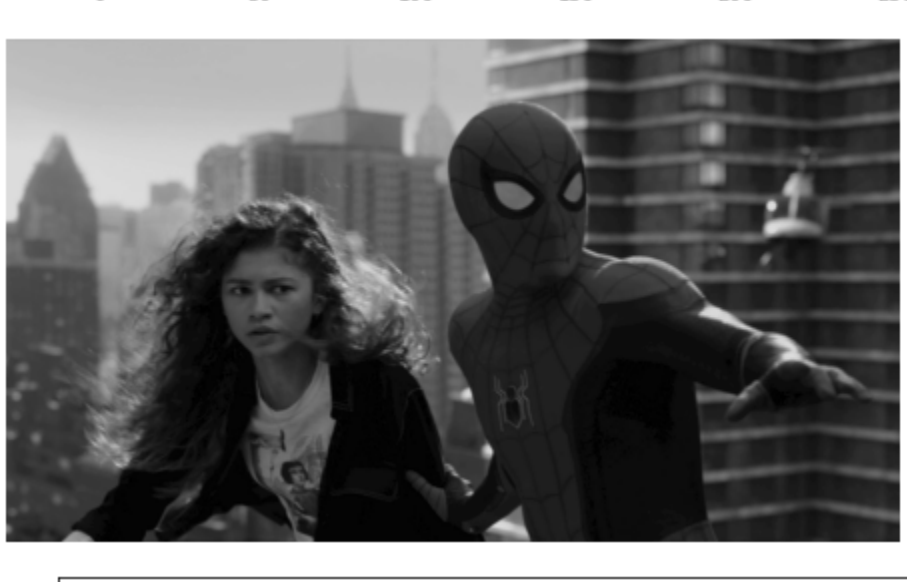
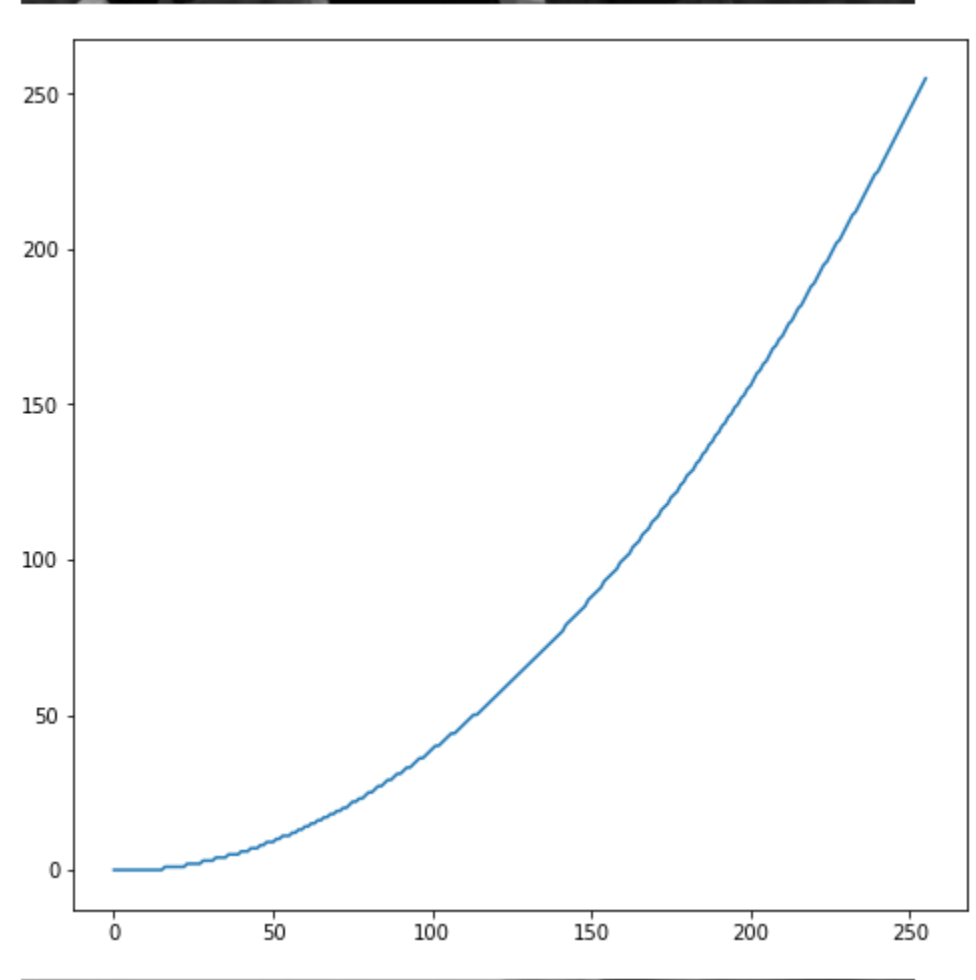
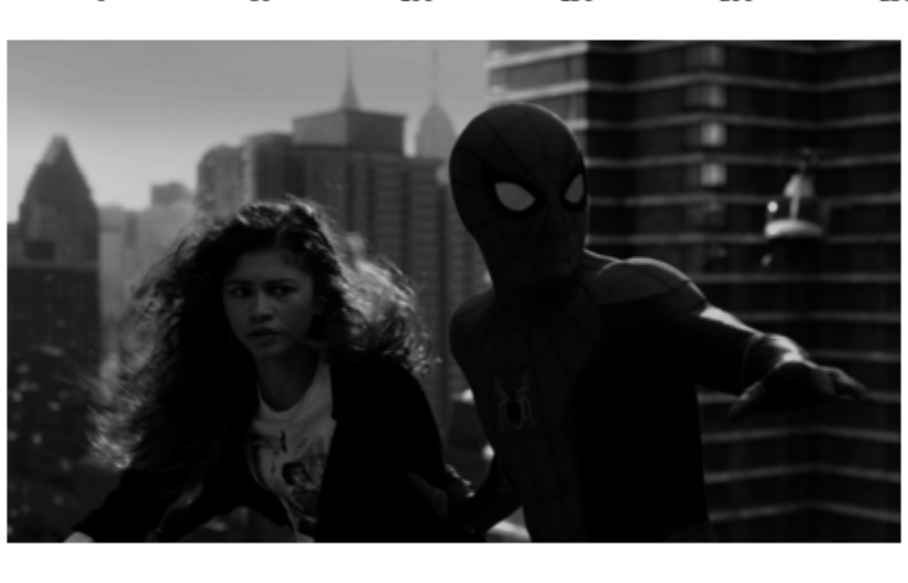
EN2250 Exercise 2 Intensity Transformations

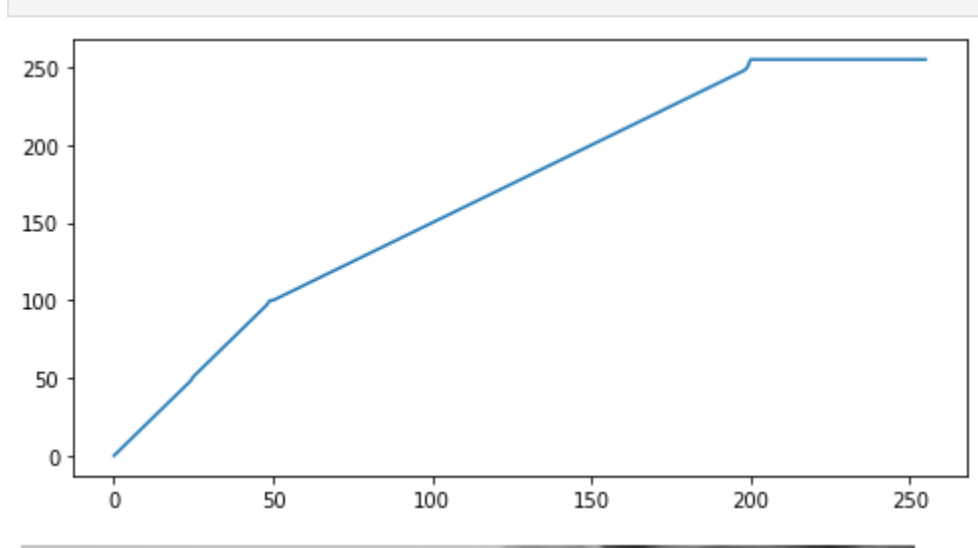
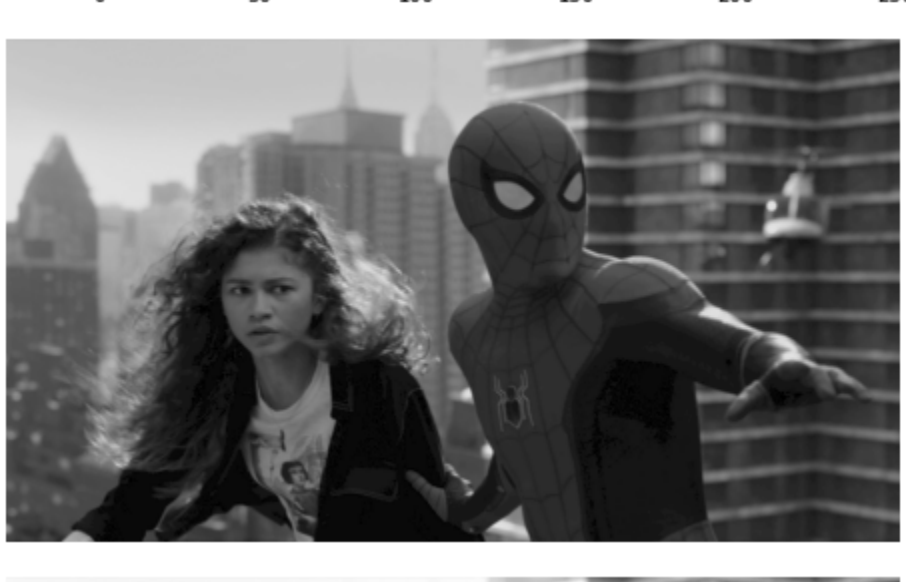
(1)

In [1]:
```python
import numpy as np
import cv2 as cv
import matplotlib.pyplot as plt

f = cv.imread(r'Images/spider.PNG', cv.IMREAD_GRAYSCALE)
assert f is not None

gamma = [0.2, 0.8, 1.2, 2]
for i in gamma:
    t = np.array([(p/255)**(i)*255 for p in range(0, 256)]).astype(np.uint8)
    g = cv.LUT(f, t)

    cv.namedWindow('Image', cv.WINDOW_AUTOSIZE)
    cv.imshow('Image', f)
    cv.waitKey(1000)
    cv.imshow('Image', g)
    cv.waitKey(1000)
    cv.destroyAllWindows()

    fig, ax = plt.subplots(1, 1, figsize=(8, 8))
    ax.plot(t)
    fig, ax = plt.subplots(1, 1, figsize=(8, 8))
    implot = plt.imshow(cv.cvtColor(g, cv.COLOR_BGR2RGB))
    plt.axis('off')
```

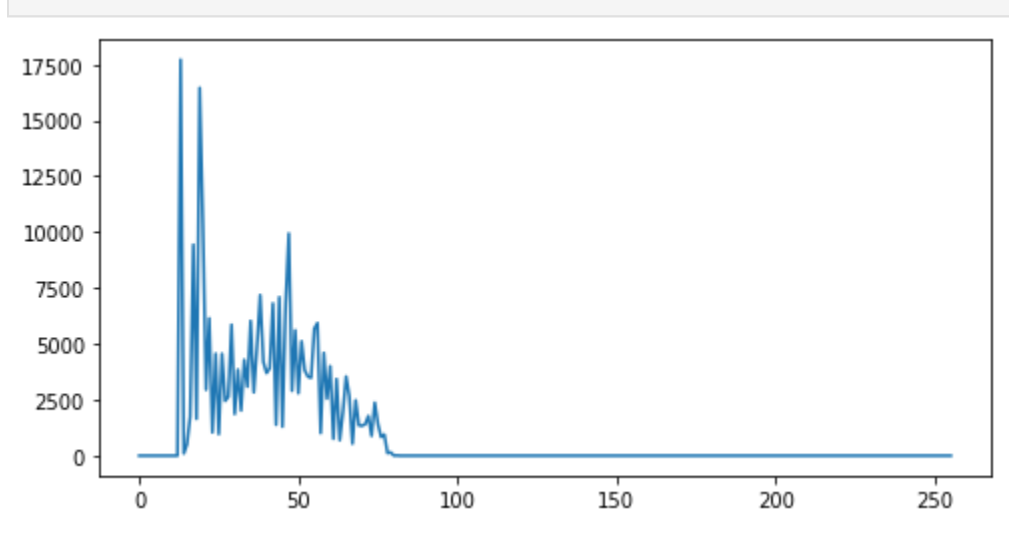
(2)

In [2]:
```python
f = cv.imread(r'Images/spider.PNG', cv.IMREAD_GRAYSCALE)
assert f is not None

t1 = np.linspace(0, 100, 50)
t2 = np.linspace(100, 250, 150)
t3 = np.linspace(255, 255, 56)

t = np.concatenate((t1, t2, t3), axis=0).astype(np.uint8)
plt.subplots(1, 1, figsize=(8, 4))
plt.plot(t)
ax.set_aspect('equal')
assert len(t) == 256
g = cv.LUT(f, t)

cv.namedWindow('Image', cv.WINDOW_AUTOSIZE)
cv.imshow('Image', f)
cv.waitKey(2000)
cv.imshow('Image', g)
cv.waitKey(2000)
cv.destroyAllWindows()

fig, ax = plt.subplots(1, 1, figsize=(8, 8))
implot = plt.imshow(cv.cvtColor(f, cv.COLOR_BGR2RGB))
plt.axis('off')
fig, ax = plt.subplots(1, 1, figsize=(8, 8))
implot = plt.imshow(cv.cvtColor(g, cv.COLOR_BGR2RGB))
plt.axis('off')

plt.show()
```

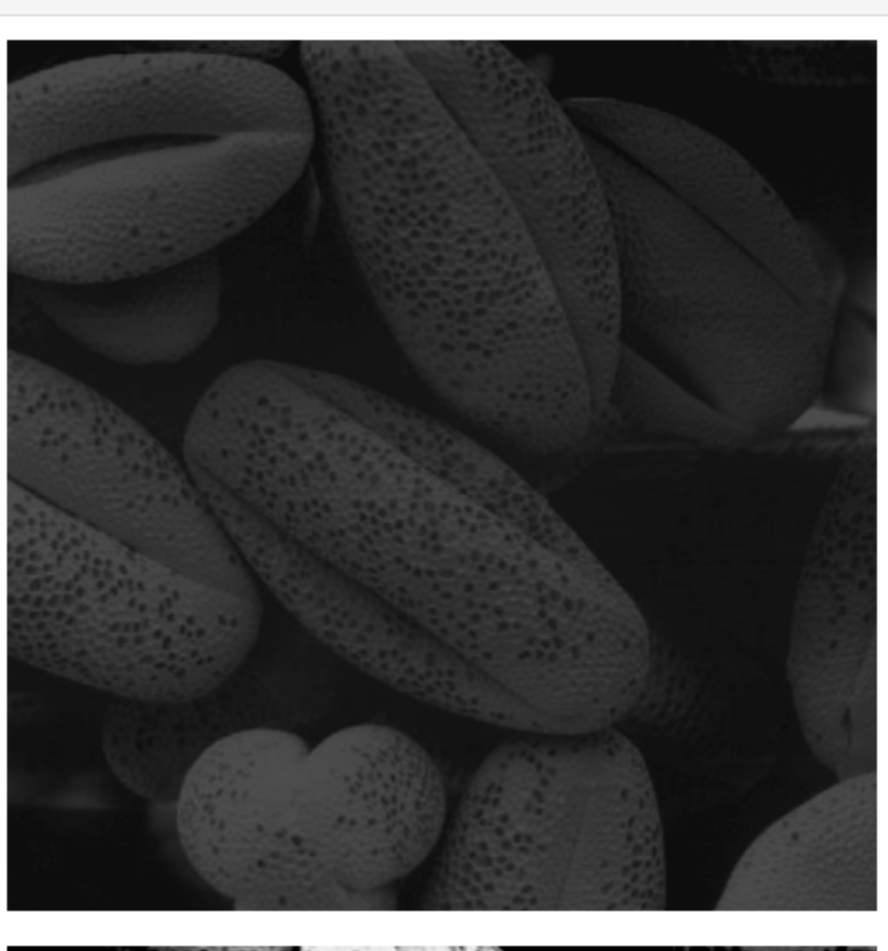

(3) (a)

In [3]:
```python
f = cv.imread(r'Images/shells.tif', cv.IMREAD_GRAYSCALE)
assert f is not None

hist_f = cv.calcHist([f], [0], None, [256], [0, 256])
g = cv.equalizeHist(f)
hist_g = cv.calcHist([g], [0], None, [256], [0, 256])

fig, ax = plt.subplots(1, 1, figsize=(8, 4))
ax.plot(hist_f)

plt.show()
```



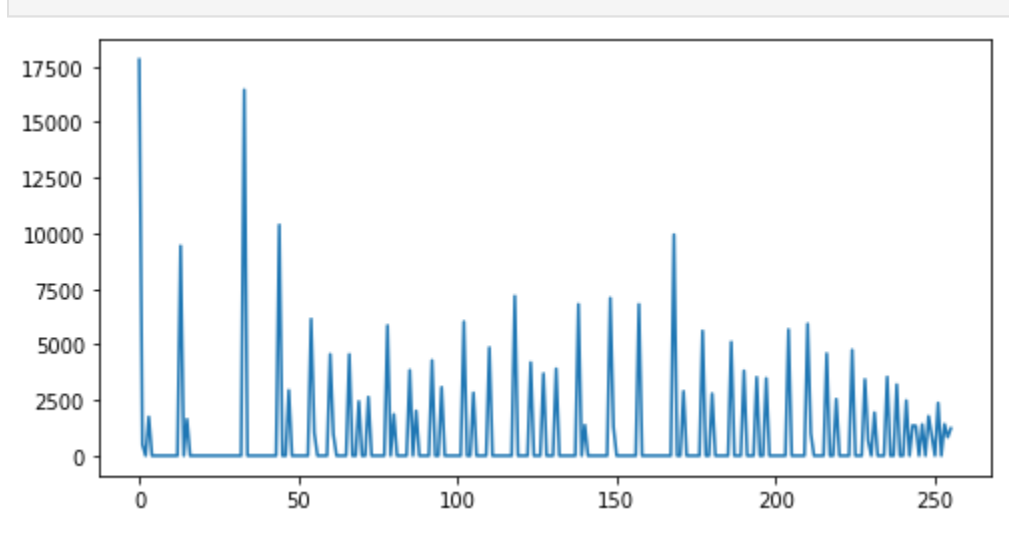
(3) (b)

In [4]:
```python
cv.namedWindow('Image', cv.WINDOW_AUTOSIZE)
cv.imshow('Image', f)
cv.waitKey(2000)
cv.imshow('Image', g)
cv.waitKey(2000)
cv.destroyAllWindows()

fig, ax = plt.subplots(1, 1, figsize=(8, 8))
implot = plt.imshow(cv.cvtColor(f, cv.COLOR_BGR2RGB))
plt.axis('off')
fig, ax = plt.subplots(1, 1, figsize=(8, 8))
implot = plt.imshow(cv.cvtColor(g, cv.COLOR_BGR2RGB))
plt.axis('off')

plt.show()
```




(3) (c)

In [5]:
```python
fig, ax = plt.subplots(1, 1, figsize=(8, 4))
ax.plot(hist_g)

plt.show()
```



(4) (a)

In [6]:
```python
img = cv.imread(r'./Images/zion_pass.jpg')

cv.namedWindow('Image', cv.WINDOW_AUTOSIZE)
cv.imshow('Image', img)
cv.waitKey(2000)

fig, ax = plt.subplots(1, 1, figsize=(8, 8))
implot = plt.imshow(cv.cvtColor(img, cv.COLOR_BGR2RGB))
plt.axis('off')

hsv = cv.cvtColor(img, cv.COLOR_BGR2HSV)

for x in range(0, len(hsv)):
    for y in range(0, len(hsv[0])):
        hsv[x, y][1] += 100

img = cv.cvtColor(hsv, cv.COLOR_HSV2BGR)

cv.imshow('Image', img)
cv.waitKey(2000)
cv.destroyAllWindows()

fig, ax = plt.subplots(1, 1, figsize=(8, 8))
implot = plt.imshow(cv.cvtColor(img, cv.COLOR_BGR2RGB))
plt.axis('off')

plt.show()
```


(4) (b)

In [7]:
```python
img = cv.imread(r'./Images/zion_pass.jpg')

cv.namedWindow('Image', cv.WINDOW_AUTOSIZE)
cv.imshow('Image', img)
cv.waitKey(2000)

fig, ax = plt.subplots(1, 1, figsize=(8, 8))
implot = plt.imshow(cv.cvtColor(img, cv.COLOR_BGR2RGB))
plt.axis('off')

hsv = cv.cvtColor(img, cv.COLOR_BGR2HSV)

for x in range(0, len(hsv)):
    for y in range(0, len(hsv[0])):
        hsv[x, y][0] += 100

img = cv.cvtColor(hsv, cv.COLOR_HSV2BGR)

cv.imshow('Image', img)
cv.waitKey(2000)
cv.destroyAllWindows()

fig, ax = plt.subplots(1, 1, figsize=(8, 8))
implot = plt.imshow(cv.cvtColor(img, cv.COLOR_BGR2RGB))
plt.axis('off')

plt.show()
```